DESIGN NOISE REPORT

I-85 Greensboro Bypass
From Southeast of Wiley-Lewis Road (SR 3314) to West of McConnell Road (SR 3000)
Guilford County
State Project No. 8.U492301
F.A. Project No. NHF-85-3(151)
TIP No. I-2402(C)

Prepared by: Ko & Associates, P.C.

For

North Carolina Department of Transportation

July 23, 1996

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PROJECT LOCATION and DESCRIPTION

This project consists of building a new six-lane divided freeway facility in the southern portion of Greensboro. The project begins southeast of Wiley-Lewis Road (SR 3314) and ends west of McConnell Road (SR 3000). Figure 1 illustrates the project study area. Access will be fully controlled on this facility and the posted speed will be 105 kmph (65 mph).

PROCEDURE

Preliminary analysis of the probable traffic noise impacts of this project are contained in the Draft Environmental Impact Statement (DEIS) prepared for the I-85 Greensboro Bypass, approved by the Federal Highway Administration (FHWA) in February, 1992. This design noise report presents a more detailed analysis of the improvements for this section of the I-85 Greensboro Bypass.

As part of this evaluation, current existing noise levels were measured in the vicinity of the proposed project. Predictions were also made of the maximum design year peak hour Leq traffic noise levels expected at receptors in the vicinity of the project. The procedure used to predict future noise levels in this study was the FHWA Noise Barrier Cost Reduction Procedure, STAMINA 2.0 and OPTIMA (revised March, 1983). The Barrier Cost Reduction (BCR) procedure is based upon FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108).

CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. Highway noise, or traffic noise, is usually a composite of noises from engine, exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually the decibel (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency weighted scales (A, B, C, or D).

The weighted-A decibel scale is used almost exclusively in vehicle noise measurements because it places the most emphasis on the frequency range to which the human ear is most sensitive (1,000 to 6,000 Hertz). Sound levels measured using a weighted-A decibel scale are often expressed as dBA. Throughout this report, all noise levels will be expressed in dBA's. Several examples of noise pressure levels in dBA are listed in Table 1.

Review of Table 1 indicates that most individuals in urbanized areas are exposed to fairly high noise levels from many sources as they go about their daily activities. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

1) The amount and nature of the intruding noise.
2) The relationship between the background noise and the intruding noise.
3) The type of activity occurring when the noise is heard.

In considering the first of these three factors, it is important to note that individuals have different sensitivity to noise. Loud noises bother some more than others and some individuals become upset if an unwanted noise persists. The time patterns of noise also enter into an individual's judgement of whether or not a noise is offensive. For example, noises occurring during sleeping hours are usually considered to be more offensive than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). The blowing of a car horn at night when background noise levels are approximately 45 dBA would generally be more objectionable than the blowing of a car horn in the afternoon when background noises might be 55 dBA.

The third factor is related to the interference of noise with activities of individuals. In a 60 dBA environment, normal conversation would be possible while sleep might be difficult. Work activities requiring high levels of concentration may be interrupted by loud noises while activities requiring manual effort may not be interrupted to the same degree.

Over time, particularly if the noises occur at predicted intervals and are expected, individuals tend to accept the noises which intrude into their lives. Attempts have been make to regulate many of these types of noises including airplane noise, factory noise, railroad noise, and highway traffic noise. In relation to highway traffic noise, methods of analysis and control have developed rapidly over the past few years.

NOISE ABATEMENT CRITERIA

To determine if highway noise levels are compatible with various land uses, the FHWA has developed noise abatement criteria and procedures to be used in the planning and design of highways. These abatement criteria and procedures are in accordance with Title 23 Code of Federal Regulations (CFR), Part 772, U.S. Department of Transportation, Federal Highway

Administration (FHWA), Procedures for Abatement of Highway Traffic Noise and Construction Noise. A summary of the FHWA Noise Abatement Criteria (NAC) for various land uses is presented in Table 2. Sound pressure levels in this report are referred to as Leq(h). The hourly Leq, or equivalent sound level, is the level of constant sound which in an hour would contain the same acoustic energy as the time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content. Also, one factor for considering traffic noise mitigation is when future noise levels either approach or exceed the criteria levels for each activity category. Title 23 CFR, Section 772.11(a) states, "In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit." For this project, all the identified receptors were residential development.

AMBIENT NOISE LEVELS

Ambient noise is that which results from natural and mechanical sources and human activity, and that which is considered to be usually present in a particular area. Ambient noise measurements were taken in the vicinity of the project to determine the existing background noise levels. The purpose of this noise level information was to quantify the existing acoustic environment and to provide a base for assessing the impact of future noise levels from the project on the receptors in the vicinity of the project. The existing Leq noise levels in the project area as measured at 15 meters from the roadways and approximately 1.5 meters above the ground are shown in Table 3.

The existing roadway and traffic conditions were used with the most current traffic noise prediction model in order to calculate existing noise levels for comparison with noise levels actually measured. The calculated existing noise levels were within 4dBA of the measured noise levels for the locations where noise measurements were obtained. Hence, the computer model is a reliable tool in the prediction of noise levels. Differences in dBA levels can be attributed to "bunching" of vehicles, low traffic volumes, and actual vehicle speeds versus the computer's "evenly-spaced" vehicles and single vehicular speed.

PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

The prediction of highway traffic noise is a complicted procedure. In general, the traffic situation is composed of a large number of variables which describe different cars driving at different speeds through a continual changing highway configuration and surrounding terrain. Due to the complexity of the problem, certain assumptions and simplifications must be made to predict highway traffic noise.

The BCR traffic noise prediction model uses the number and type of vehicles on the planned roadway, their speeds, the physical characteristics of the road (horizontal and vertical alignment, grades, cut or fill sections, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier top elevation.

The noise predictions made in this report are highway-related noise predictions for the traffic conditions during the year being analyzed. Peak hour design and level-of-service (LOS) C volumes were compared, and the volumes resulting in the noisiest conditions were used with the proposed posted speed limits to predict future noise levels. During all other time periods, the noise levels will be no greater than those indicated in this report.

First, this computerized model was utilized in order to determine the number of land uses (by type) which would be impacted during the peak hour of the design year 2020. The basic approach was to select receptor locations such as 7.5, 15, 30, 60, 120, 240, and 480 meters from the center of the near traffic lane (adaptable to both side of the roadway). The location of these receptors were determined by the changes in projected traffic volumes and/or the posted speed limits along the proposed project. The result of this procedure was a grid of receptor points along the project. Using this grid, noise levels were calculated for each identified receptor along the project. Receptors calculated to approach or exceed the FHWA NAC or to experience a substantial increase will be analyzed in detail in subsequent sections of this report.

The Leq traffic noise exposures associated with this project are listed in Table 4. Information included in this table consists of listings of all receptors in close proximity to the project, their ambient and predicted noise levels, and the estimated noise level increases for each.

The exposure impacts of the project are listed in Table 5 and are noted in terms of those receptors expected to experience traffic noise impacts by approaching or exceeding the FHWA NAC or by a substantial increase in exterior noise levels. Other information included in Table 5 is the maximum extent of the 72 and 67 dBA noise level contours and the predicted noise levels at 15, 30, and 60 meters for each segment. The 67 dBA and 72 dBA noise level contours are generally used to assess the exposure impacts of land use since receptors, particularly residential receptors which are located within the 67 dBA noise level contour, could be expected to experience traffic noise levels above the FHWA NAC. Furthermore, this information is provided to assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway and to prevent further development of incompatible activities and land uses.

Table 6 indicates the change in exterior traffic noise levels for the identified receptors in each roadway section. Predicted noise level increases for this project range from 2 to 25 dBA. Increases of this magnitude are typical on new location projects, due to the absence of substantial traffic noise in the existing acoustic environment.

TRAFFIC NOISE IMPACT ANALYSIS/ABATEMENT MEASURES

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (Table 2) with approach values being 1 dBA less than shown in the table, or [b] substantially exceed the existing noise levels.

For proposed federal roadway projects, the FHWA requires that States consider noise abatement measures for receptors which fall in either category. The following discussion addresses the applicablilty of these measures to the proposed project.

Highway Alignment Selection

Highway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of siting the roadway at a sufficient distance from noise sensitive areas. The recommended alignment selected for this project has been evaluated to provide a balance between travel needs and other engineering and environmental parameters.

Changes in the vertical alignment can be effective in limiting noise impacts of certain highway facilities. However, no major alterations in the vertical alignment are practical for the noise purposes in the design of this project. The existing vertical alignment is designed to accepted interstate standards, and is suitable for the substantial number of heavy trucks that will use this facility. The operation of heavy trucks can be adversely affected if the vertical grades are excessively steep and/or long. Any changes to the vertical alignment are also restricted by existing grade-separated roadway crossings and interchanges along this project.

Traffic System Management Measures

Traffic system management measures which limit vehicle type, speed, volume and time of operations are often effective noise abatement measures. For this project, traffic management measures are not considered appropriate for noise abatement due to their effect on the capacity and level-of-service on the proposed roadway.

Past project experience has shown that a reduction in the speed limit of 16 kmph (10 mph) would result in a noise level reduction of approximately 1 to 2 dBA. Because most people cannot detect a noise reduction of up to 3 dBA and because reducing the speed limit would reduce roadway capacity, it is not considered a viable noise abatement measure. This and other traffic system management measures, including the prohibition of truck operations, are not considered to be consistent with the project's objective of providing a high-speed, limited-access facility.

Noise Barriers

Noise barriers reduce noise levels by blocking the sound path between a roadway and noise sensitive areas. This measure is most often used on high-speed, limited-access facilities where noise levels are high and there is adequate space for continuous barriers. Noise barriers may be constructed from a variety of materials, either indivually or combined, including concrete, wood, metal, earth and vegetation.

Due to traffic noise impacts predicted for the 2020 design year, a noise barrier evaluation was conducted for this project. The evaluataion was accomplished in two steps. First, a qualitative

barrier evaluation was performed for each impacted receptor which considered each receptor's FHWA NAC activity category, source-receptor relationships, impacted site densities, and the ability to have continuous barriers. The qualitative evaluation resulted in the selection of two potential barrier locations. These are located west of Wiley-Lewis Road (SR 3314) and west of Young's Mill Road (SR 3029).

The second step of the barrier evaluation involved the computer modeling of noise barriers at the candidate locations, using the FHWA's noise barrier simulation model, OPTIMA. The analysis was accomplished by developing barriers with OPTIMA which would meet minimum noise reduction goals at the impacted site, by estimating the cost of the barrier, and by determining the cost per benefitted receptor. The NCDOT defines benefitted receptors as all receptors, impacted and non-impacted, which, by placement of the noise mitigation measure, receives a minimum noise level reduction of 4 dBA.

In order for a noise barrier to be considered feasible, it must meet, among other factors, the following conditions:

1. Provide a minimum insertion loss of 6 dBA, preferably 8 dBA or more (for receptors adjacent to the project);

2. Located in an acoustic environment where no other noise sources are present;

3. Suitable for construction given the topography of the location.

A primary consideration of the reasonableness of noise barrier installation is that it costs no more than $25,000 per benefitted receptor (those impacted nor non-impacted receptors receiving 4 dBA or more reduction).

Location 1- West of Wiley-Lewis Road (SR 3314), Receptors #40-45

Noise mitigation in the form of a concrete barrier was analyzed for a cluster of residences, #40-45. The barrier was located outside of the proposed slope-stake limit, approximately 70 meters from the centerline of proposed I-85. A barrier 7.6 meters (25 ft) high, the maximum height allowed by NCDOT guidelines, would not effectively benefit any of the five analyzed receptors (provide a minimum insertion loss greater than or equal to 4 dBA). Due to the excessive cost versus the benefit of the abatement measure, noise abatement at this location is not considered to be reasonable and is not recommended at this location.

Location 2 - West of Young's Mill Road (SR 3029), Receptors #112-116

Noise mitigation in the form of a concrete barrier was analyzed for a cluster of residences, #112-116. The barrier was located outside of the proposed slope-stake limit, approximately 140 meters from the centerline of proposed I-85 (30 meters from the centerline of Ramp C). A barrier 7.6 meters (25 ft) high, the maximum height allowed by NCDOT guidelines, would effectively benefit one of the analyzed receptors at a cost of $168,382. The cost per benefitted receptor is $168,382 and is not considered to be reasonable nor feasible by NCDOT guidelines.

Of the 2 barriers evaluated, none were estimated to provide substantial noise reduction for less than $25,000 per dwelling unit.

"DO NOTHING" ALTERNATIVE

The traffic noise impacts for the "do-nothing" or "no-build" alternative were also considered. If the traffic currently using the network of roads in the project area should double, the future traffic noise levels would increase approximately 2-3 dBA. This small increase to present noise levels would be barely noticeable to the people working and living in the area.

CONSTRUCTION NOISE

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts, such as temporary speech interference for passers-by and those individuals living or working near the project, can be expected particularly from paving operations and from the earth moving equipment during grading operations. However, considering the relatively short-term nature of construction noise and the limitation of construction todaytime hours, these impacts are not expected to be substantial. The transmission loss characteristics of nearby natural elements and man-made structures are believed to be sufficient to moderate the effects of intrusive construction noise.

SUMMARY

Based on these studies, traffic noise abatement is not recommended, and no noise abatement measures are proposed. This evaluation completes the highway traffic noise requirements of Title 23 CFR Part 772, and unless a major project change develops, no additional noise reports will be submitted for this project.

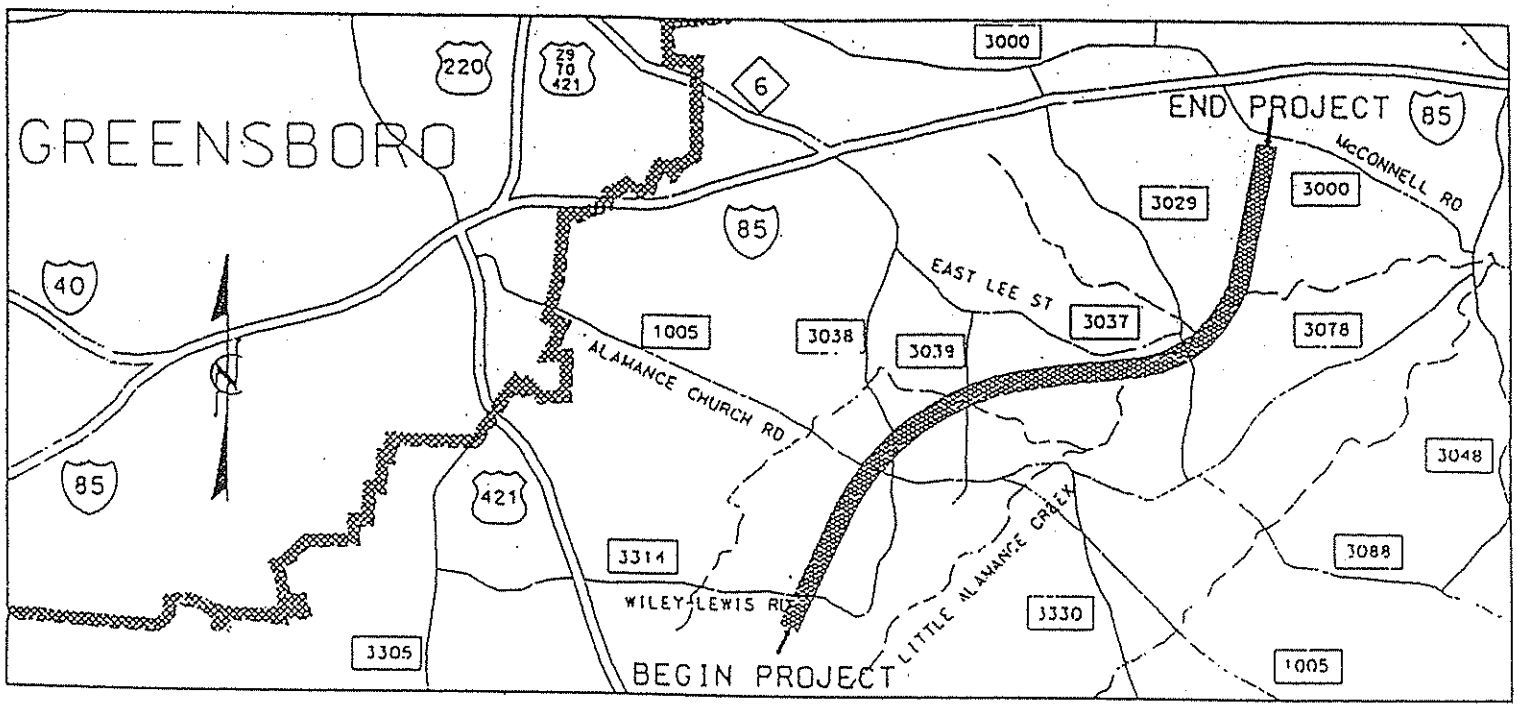

FIGURE 1- PROJECT LOCATION

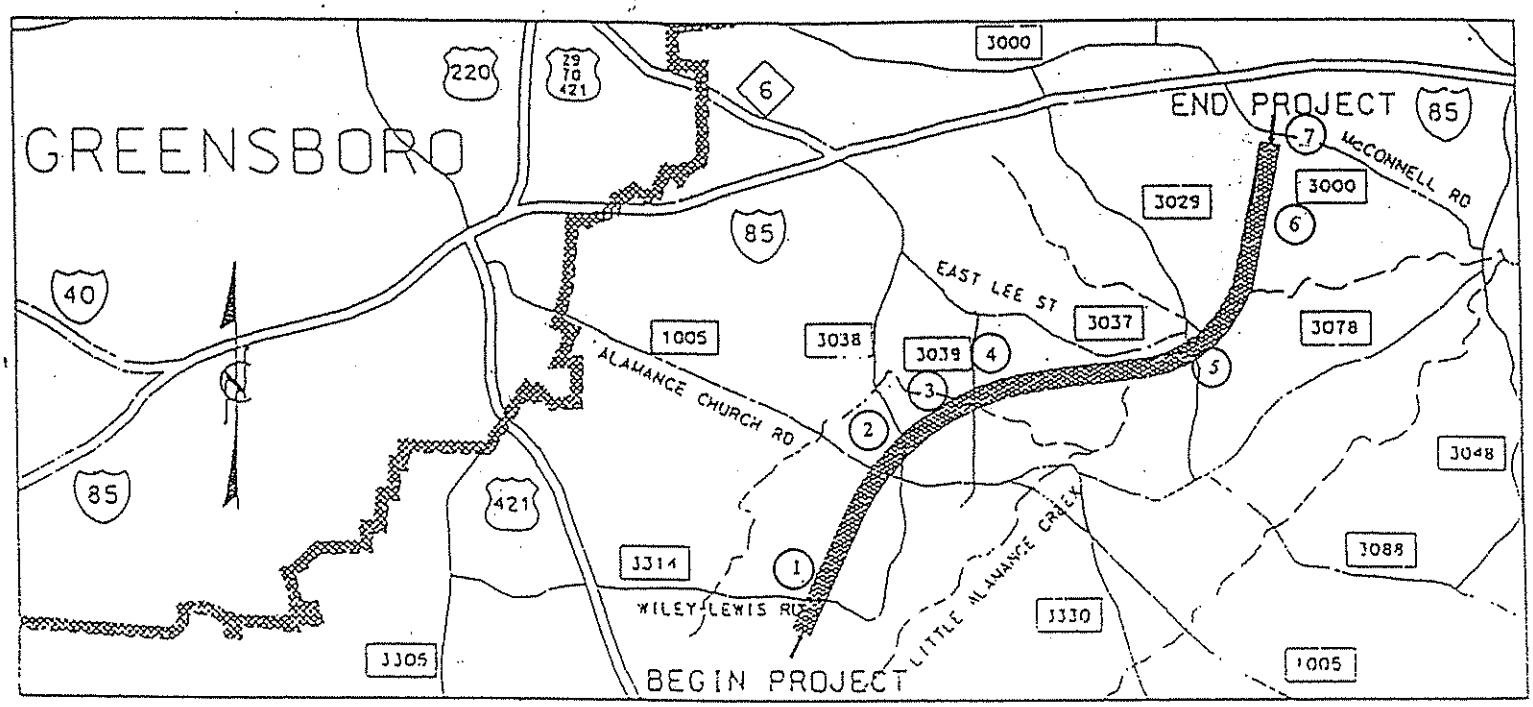

FIGURE 2 - AMBIENT MEASUREMENT SITES

TABLE 1

HEARING: SOUNDS BOMBARDING US DAILY

DECIBELS			
	140	Shotgun blast, jet 30m away at takeoff Motor test chamber	PAIN HUMAN EAR PAIN THRESHOLD
	130		
	120	Firecrackers Severe thunder. Pneumatic jackhammer Hockey crowd Amplified rock music	UNCOMFORTABLY LOUD
	110		
	100	Textile loom Subway train, elevated train, farm tractor Power lawn mower, newspaper press Heavy city traffic, noisy factory	LOUD
	90		
	80	Diesel truck 65kmph 15m away Crowded restaurant, garbage disposal Average factory, vacuum cleaner Passenger car 80kmph 15m away	MODERATELY LOUD
	70		
	60	Quiet typewriter Singing birds, window air conditioner Quiet automobile Normal conversation, average office	QUIET
	50		
		Household refrigerator Quiet office	VERY QUIET
	40		
		Average home	
	30	Dripping faucet Whisper 1.5m away	
	20	Light rainfall, rustle of leaves	AVERAGE PERSON'S THRESHOLD OF HEARING
		Whisper	JUST AUDIBLE
	10		
	0		

Sources: World Book, Rand McNally Atlas of the Human Body, Encyclopedia Americana, "Industrial Noise and Hearing Conversation" by J.B. Olishifski and E.R. Harford (Researched by N. Jane Hunt and published in the Chicago Tribune in an illustrated graphic by Tom Heinz.)

TABLE 2

NOISE ABATEMENT CRITERIA

Hourly A-Weighted Sound Level - decibels (dBA)

Activity Category	Leq(h)	Description of Activity Category
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 Exterior	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Title 23 Code of Federal Regulations (CFR) Part 772, U.S. Department of Transportation, Federal Highway Administration

DEFINITION OF SUBSTANTIAL INCREASE

Hourly A-Weighted Sound Level - decibels (dBA)

Existing Noise Level in Leq(h)	Increase in dBA from Existing Noise Levels to Future Noise Levels
≤ 50	≥ 15
>50	≥ 10

Source: North Carolina Department of Transportation Noise Abatement Guidelines

TABLE 3

AMBIENT NOISE FIELD MEASUREMENTS

ROAD NAME	LOCATION	DESCRIPTION	NOISE LEVEL dBA
SR 3314 (Wiley Lewis Rd.)	100m west of SR 3038	Roadside	56.60
SR 1005 (Alamance Ch. Rd.)	200m west of SR 3314	Roadside	63.10
SR 3314 (Wiley Lewis Rd.)	300m north of SR 1005	Roadside	52.30
SR 3039 (Nelson Farm Rd.)	180m north of bridge	Roadside	60.00
SR 3029 (Young's Mill Rd.)	315m south of SR 3037	Roadside	55.30
SR 3077 (Brookhaven Drive)	220m south of SR 3000	Roadside	48.30
SR 3000 (McConnell Rd.)	20m west of SR 3135	Roadside	57.60

I-85 Bypass from south of SR 3314 to South of SR 3000.

PROJECT NO: 8.U492306[I-2402C]

TABLE 4

Leq TRAFFIC NOISE EXPOSURES

RECEPTOR ID #	INFORMATION LAND USE CATEGORY	NEAREST ROADWAY NAME	ROADWAY DISTANCE (m)	AMBIENT NOISE LEVEL	-L- OR NEAREST ROADWAY STATION	DISTANCE (m)		PREDICTED L	NOISE Y		LEVEL MAX		NOISE LEVEL INCREASE
1	Barn	Wiley Lewis			STA. 134+00								
2	Residence	Wiley Lewis	50 R	50	STA. 133+95	265	L	59	49		59		9
3	Residence	Wiley Lewis	60 R	48	STA. 134+05	200	L	61	51		61		13
4	Residence	Wiley Lewis	50 R	50	STA. 134+70	15	L	83	51		R/W		R/W
5	Residence	Wiley Lewis	50 R	50	STA. 134+60	45	L	77	51		R/W		R/W
6	Residence	Wiley Lewis	38 R	52	STA. 134+50	120	L	62	54	*	69	*	17
7	Residence	Wiley Lewis	34 R	53	STA. 134+50	145	L	62	54	*	67	*	14
8	Residence	Wiley Lewis	35 L	53	STA. 135+25	135	L	64	58		65	*	12
9	Residence	Wiley Lewis	32 L	53	STA. 134+95	220	L	61	56		62		9
10	Residence	Wiley Lewis	200 R	48	STA. 133+50	150	R	65	48		65	*	17
11	Residence	Wiley Lewis	128 R	48	STA. 134+60	170	R	61	48		61		13
12	Residence	Wiley Lewis	60 R	48	STA. 134+75	45	R	77	50		R/W		R/W
13	Residence	Wiley Lewis	90 R	48	STA. 134+80	125	R	64	48		64	*	16
14	Residence	Wiley Lewis	45 R	51	STA. 134+87	35	R	79	53		R/W		R/W
15	Residence	Wiley Lewis	130 R	48	STA. 134+90	225	R	59	48		59		11
16	Residence	Wiley Lewis	53 R	50	STA. 134+90	65	R	74	51		R/W		R/W
17	Residence	Wiley Lewis	40 R	52	STA. 135+10	70	R	73	52		R/W		R/W
18	Residence	Wiley Lewis	55 R	50	STA. 135+30	155	R	62	51		62		12
19	Residence	Wiley Lewis	40 R	52	STA. 135+45	150	R	62	53		63	*	11
20	Residence	Wiley Lewis	165 R	48	STA. 134+80	300	R	57	48		58		10
21	Residence	Wiley Lewis	115 R	48	STA. 135+20	345	R	56	48		57		9
22	Residence	Wiley Lewis	32 R	53	STA. 135+65	170	R	61	55		62		9
23	Residence	Wiley Lewis	75 R	48	STA. 135+70	295	R	58	50		59	*	11
24	Residence	Wiley Lewis	33 R	53	STA. 135+80	210	R	59	56		61		8
25	Residence	Wiley Lewis	35 R	53	STA. 136+00	255	R	59	56		61		8
26	Residence	Wiley Lewis	85 R	48	STA. 135+40	380	R	56	48		57		9
27	Residence	Wiley Lewis	50 R	50	STA. 135+70	370	R	56	52		57		7
28	Residence	Wiley Lewis	30 R	53	STA. 136+10	325	R	57	57		60		7
29	Residence	Wiley Lewis	60 L	49	STA. 136+50	130	R	62	54		62		13
30	Residence	Wiley Lewis	60 L	49	STA. 136+85	200	R	61	52		62		13
31	Residence	Wiley Lewis	45 L	51	STA. 136+90	300	R	58	54		59		8
32	Residence	Wiley Lewis	55 L	49	STA. 137+10	355	R	57	52		58		9
33	Residence	Wiley Lewis	115 L	48	STA. 137+30	160	R	63	48		63	*	15
34	Residence	Wiley Lewis	115 L	48	STA. 137+60	315	R	59	48		59		11
35	Residence	Wiley Lewis	175 L	48	STA. 138+20	305	R	59	48		59		11
36	Residence	Wiley Lewis	225 L	48	STA. 138+80	300	R	60	48		60		12
37	Residence	Wiley Lewis	265 L	48	STA. 139+25	307	R	62	48		62		14
38	Residence	Wiley Lewis	300 L	48	STA. 139+70	225	R	64	48		64	*	16
39	Trailer	SR 3319	35 R	48	STA. 141+50	115	L	69	48	*	69	*	21
40	Residence	SR 3319	45 L	48	STA. 143+45	105	L	69	48	*	69	*	21
41	Residence	SR 3319	95 R	48	STA. 143+85	285	L	62	48		62		14
42	Residence	SR 3319	15 L	48	STA. 144+35	185	L	66	48	*	66	*	18

NOTE:

(1) Distances are measured from the centerline of the near travel lane.

(2) Right of way width is equal to Slope stake width.

* Traffic Noise Impact (per 23 CFR Part 772)

I-85 Bypass from south of SR 3314 to South of SR 3000.

PROJECT NO: 8.U492306[I-2402C]

TABLE 4

Leq TRAFFIC NOISE EXPOSURES

RECEPTOR ID #	INFORMATION LAND USE CATEGORY	NEAREST ROADWAY NAME	ROADWAY DISTANCE (m)	AMBIENT NOISE LEVEL	-L- OR NEAREST ROADWAY STATION	DISTANCE (m)		PREDICTED L	NOISE Y		LEVEL MAX		NOISE LEVEL INCREASE
43	Residence	SR 3319	52 R	48	STA. 144+40	265	L	63	48		63	*	15
44	Residence	SR 3319	35 R	48	STA. 144+50	250	L	63	48		63	*	15
45	Residence	SR 3319	50 R	48	STA. 144+55	270	L	63	48		63	*	15
46	Residence	SR 3563	45 L	48	STA. 143+60	250	R	63	48		63	*	15
47	Residence	SR 3563	65 L	48	STA. 143+80	340	R	61	48		61		13
48	Residence	SR 3563	35 L	48	STA. 144+00	320	R	61	48		61		13
49	Residence	SR 3563	38 R	48	STA. 144+75	290	R	62	48		62		14
50	Residence	SR 3506	32 R	48	STA. 144+90	335	R	61	48		61		13
51	Residence	SR 3506	45 L	48	STA. 145+50	300	R	62	48		62		14
52	Residence	SR 3506	36 L	48	STA. 145+70	310	R	61	48		61		13
53	Residence	SR 3506	28 L	48	STA. 145+90	360	R	60	48		60		12
54	Residence	SR 3506	80 R	48	STA. 146+40	110	R	69	48	*	69	*	21
55	Residence	SR 3506	130 R	48	STA. 146+50	145	R	67	48	*	67	*	19
56	Residence	Alam. Ch. Rd.	295 R	48	STA. 147+05	55	R	75	56		R/W		R/W
57	Shed	Alam. Ch. Rd.			STA. 134+90								
58	Residence	Wiley Lewis	53 R	52	STA. 148+85	345	R	59	55		60		8
59	Residence	Alam. Ch. Rd.	47 R	61	STA. 149+50	15	R	84	65		R/W		R/W
60	Residence	Alam. Ch. Rd.	27 R	65	STA. 149+85	55	R	73	78		R/W		R/W
61	Residence	Alam/Wiley Rd	52/120 R	61	STA. 150+00	135	R	67	75		R/W		R/W
62	Residence	Alam/Wiley Rd	62/68 R	59	STA. 150+20	180	R	65	76		R/W		R/W
63	Business	Alam. Ch. Rd.	23 L	66	STA. 150+30	35	R	79	64		R/W		R/W
64	Residence	Alam/Wiley Rd	35/77 L/R	63	STA. 151+00	115	R	69	58		R/W		R/W
65	Residence	Alam/Wiley Rd	45/27 L/R	62	STA. 151+40	155	R	67	60	*	68		6
66	Residence	Alam/Wiley Rd	35/35 L	63	STA. 151+50	210	R	64	59		65		2
67	Residence	Alam/Wiley Rd	105/165 L/R	56	STA. 151+10	R/W	R/W	86	56		R/W		R/W
68	Residence	Alam/Wiley Rd	83/58 L	57	STA. 152+10	200	R	65	60	*	66		9
69	Residence	Alam/Wiley Rd	150/25 L/R	57	STA. 152+20	85	R	71	59		R/W		R/W
70	Residence	Alam. Ch. Rd.	43 R	62	STA. 149+10	265	L	60	64		65		3
71	Residence	Alam. Ch. Rd.	28 R	65	STA. 149+30	190	L	63	68	*	69		4
72	Residence	Alam. Ch. Rd.	25 R	66	STA. 149+37	165	L	64	69	*	70		4
73	Residence	Alam. Ch. Rd.	24 L	66	STA. 149+00	145	L	65	69		R/W		R/W
74	Residence	Alam. Ch. Rd.	30 L	64	STA. 150+10	45	L	77	67		R/W		R/W
75	Residence	Alam. Ch. Rd.	40 L	62	STA. 150+25	20	L	83	64		R/W		R/W
76	Residence	Alam. Ch. Rd.	80 L	58	STA. 150+65	25	L	82	59		R/W		R/W
77	Residence	Wiley Lewis	30 L	53	STA. 153+60	35	R	80	57		R/W		R/W
78	Residence	Wiley Lewis	55 L	50	STA. 154+20	60	R	74	53		R/W		R/W
79	Shed	Wiley Lewis			STA. 155+00								
80	Residence	Wiley Lewis	90 L	48	STA. 154+95	160	L	66	49	*	67	*	19
81	Residence	Wiley Lewis	130 L	48	STA. 155+30	200	L	64	48		64	*	16
82	Residence	Wiley Lewis	80 L	48	STA. 156+50	215	R	64	55		65	*	17
83	Residence	Wiley Lewis	80 L	48	STA. 158+30	310	R	61	55		62		14
84	Residence	Nelson Farm	155 R	58	STA. 158+80	185	R	65	55		65		7

NOTE:

(1) Distances are measured from the centerline of the near travel lane.

(2) Right of Way width is equal to Slope stake width.

* Traffic Noise Impact (per 23 CFR Part 772)

I-85 Bypass from south of SR 3314 to South of SR 3000.

PROJECT NO: 8.U492306[I-2402C]

TABLE 4

Leq TRAFFIC NOISE EXPOSURES

RECEPTOR ID #	INFORMATION LAND USE CATEGORY	NEAREST ROADWAY NAME	ROADWAY DISTANCE (m)	AMBIENT NOISE LEVEL	-L- OR NEAREST ROADWAY STATION	DISTANCE (m)		PREDICTED L	NOISE Y		LEVEL MAX		NOISE LEVEL INCREASE
85	Residence	Nelson Farm	125 R	48	STA. 159+05	195	R	65	48		65	*	17
86	Residence	Nelson Farm	140 R	48	STA. 159+20	140	R	67	48	*	67	*	19
87	Residence	Nelson Farm	120 R	48	STA. 159+30	160	R	66	48	*	66	*	18
88	Residence	Nelson Farm	80 R	48	STA. 158+80	320	R	61	48		61		13
89	Residence	Nelson Farm	45 R	50	STA. 160+20	180	R	65	52		65	*	15
90	Residence	Nelson Farm	45 R	50	STA. 162+10	15	L	85	53		R/W		R/W
91	Shed	Nelson Farm			STA. 162+20								
92	Shed	Nelson Farm			STA. 162+30								
93	Residence	Nelson Farm	370 L	48	STA. 164+30	410	R	58	48		58		10
94	Residence	Nelson Farm	375 L	48	STA. 164+50	360	R	60	48		60		12
95	Residence	Nelson Farm	635 L	48	STA. 167+05	435	R	59	48		59		11
96	Residence	Nelson Farm	625 L	48	STA. 167+25	410	R	59	48		59		11
97	Residence	Soil & Gravel	10 R	48	STA. 171+80	145	R	67	48	*	67	*	19
98	Residence	Soil & Gravel	8 R	48	STA. 171+95	140	R	68	48	*	68	*	20
99	Residence	East Lee St.	40 R	48	STA. 175+05	300	L	62	48		62		14
100	Residence	East Lee St.	60 R	48	STA. 175+20	310	L	62	48		62		14
101	Residence	East Lee St.	60 R	48	STA. 175+60	320	L	61	48		61		13
102	Residence	East Lee St.	190 L	48	STA. 175+75	67	L	73	48	*	73	*	25
103	Residence	East Lee St.	180 L	48	STA. 176+70	100	L	70	48	*	70	*	22
104	Residence	East Lee St.	85 L	48	STA. 177+70	220	L	64	55		65	*	17
105	Residence	East Lee St.	45 L	48	STA. 178+70	275	L	63	55		64	*	16
106	Residence	East Lee St.	45 R	49	STA. 180+00	345	L	61	53		62		13
107	Residence	East Lee St.	28 R	53	STA. 180+70	315	L	61	56		62		9
108	Residence	East Lee St.	105 R	48	STA. 181+30	375	L	60	48		60		12
109	Residence	East Lee St.	20 R	54	STA. 181+30	285	L	62	57		63		9
110	Residence	East Lee St.	33 R	48	STA. 182+10	265	L	62	48		62		14
111	Residence	East Lee St.	65 R	48	STA. 182+00	300	L	61	48		61		13
112	Residence	Young Mill Rd.	160 R	48	STA. 180+90	240	R	63	48		63	*	15
113	Residence	Young Mill Rd.	150 R	48	STA. 181+10	210	R	64	49		64	*	16
114	Residence	Young Mill Rd.	90 R	49	STA. 181+40	270	R	62	52		62		13
115	Residence	Young Mill Rd.	80 R	50	STA. 181+55	250	R	63	53		63		13
116	Residence	Young Mill Rd.	80 R	50	STA. 181+80	200	R	65	54		65	*	15
117	Residence	Young Mill Rd.	18 R	61	STA. 182+75	100	R	70	60		R/W		R/W
118	Residence	Young Mill Rd.	20 L	60	STA. 183+20	95	R	70	55		R/W		R/W
119	Residence	Young Mill Rd.	40 L	56	STA. 183+30	120	R	69	53		R/W		R/W
120	Ruins	Young Mill Rd.			STA. 182+90								
121	Residence	Young/E. Lee	30/40 R/R	58	STA. 183+65	255	L	62	60		64		6
122	Business	Young Mill Rd.	40 L	55	STA. 184+50	220	L	62	58		63		8
123	Business	Young Mill Rd.	55 L	53	STA. 184+55	200	L	63	56		64	*	11

NOTE:

(1) Distances are measured from the centerline of the near travel lane.

(2) Right of Way width is equal to Slope stake width.

* Traffic Noise Impact (per 23 CFR Part 772)

TABLE 7

RELATIONSHIP BETWEEN DECIBEL, ENERGY, AND LOUDNESS

A-Level Down	Remove ___ % of Energy	Divide Loudness by
3 dBA	50	1.2
6 dBA	75	1.5
10 dBA	90	2
20 dBA	99	4

TABLE 8

BARRIER ATTENUATION

Reduction in Sound Level	Reduction in Acoustic Energy	Degree of Difficulty
5 dBA	70	Simple
10 dBA	95	Attainable
15 dBA	97	Very Difficult
20 dBA	99	Nearly Impossible

TABLE 5

FHWA NOISE ABATEMENT CRITERIA SUMMARY

Description	Maximum Predicted Leq Noise Levels dBA			Contour Distances in meters (Maximum)		Approximate Number of Impacted Receptors According to Title 23 CFR Part 772				
	15m	30m	60m	72 dBA	67 dBA	A	B	C	D	E
I-85 Bypass	83	79	75	80	145	0	39	0	0	0

NOTES:
1. 15m, 30m, and 60m distances are measured from center of nearest travel lane.
2. 72dBA and 67dBA contour distances are measured from center of proposed roadway.

TABLE 6

TRAFFIC NOISE LEVEL INCREASE SUMMARY

	Receptor Exterior Noise Level Increases							Substantial Impacts Due to	
								Noise Level Increases (1)	Both Criteria (2)
Description	0	1-4	5-9	10-14	15-19	20-24	>25		
I-85 Bypass	0	4	19	39	24	5	1	35	14

NOTES:
1. As defined by only a substantial increase (See bottom of Table2).
2. As defined by both criteria in Table 2.